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of the two great contiguous States of Missouri and Iowa, their combined value will be greatly enhanced for purely scientific purposes. We shall have a larger consecutive area of the earth's surface under minute and systematic observation than exists elsewhere to my knowledge. We can trace storms in their track over a level country, from western Kansas to the Mississippi river, many hundred miles in any direction, and can thus determine their laws and the ways of avoiding them, if this be possible. At the next annual meeting of the Academy it is hoped that the organization of the Kansas Weather Service will be so far perfected that no question will exist as to its permanence. It is not, of course, expected that the fruits of its work will be gathered or apparent the first or the second year. It may be changed in many details when experience shows such changes profitable, and ultimately should be considered a permanent feature of the Agricultural Department of the State, and be under State management. The object of bringing it at this time before the Academy, is to present its claim to scientific interest, and to secure sympathy and coöperation in a work which, if done at all, must be the labor of many hands.

METEOROLOGICAL SUMMARY.

Prof. F. H. Snow's Annual Reports as Meteorologist to the State
Board of Agriculture.

Station: Lawrence, Kas. Latitude $38^{\circ} 57' 25''$; longitude, $95^{\circ} 15'$; elevation of barometer and thermometers, 875 feet above the sea level, and 5 feet above the ground; rain-gauge on the ground; anemometer, 105 feet above the ground, on the dome of the University building, 1,200 feet above the sea level.

SUMMARY FOR 1878.

The chief characteristics of the weather of 1878 were the large and well-distributed rainfall, the high average temperature, the absence of great extremes of temperature, the long period of immunity from severe frosts, the comparative lightness of the winds, and low temperature and great snowfall of the month of December.

TEMPERATURE.

Mean temperature of the year, 55.33° , which is 2.37° above the mean of the ten preceding years. The highest temperature was 98° , on the 15th of July and 24th of August; the lowest was 6° below zero, on the 18th and 25th of December, giving a yearly range of 104° . Mean temperature at 7 a. m., 49.46° ; at 2 p. m., 64.32° ; at 9 p. m., 55.31° .

Mean temperature of the winter months, 32.41° , which is 2.79° above the average winter temperature; of the spring, 57.37° , which is 4.58° above the average; of the summer, 75.13° , which is 1.2° below the average; of the autumn, 56.13° , which is 3.87° above the average.

The coldest month of the year was December, with a mean temperature of 23.05° ; the coldest week was December 21st to 27th, with mean temperature, 11.18° ; the coldest day was December 24th, with mean temperature, 4.3° . The mercury fell below zero seven times, all of which were in December.

The warmest month of the year was July, with a mean temperature of 78.45° ; the warmest week was July 10th to 16th, with mean temperature, 83.90° ; the warmest day was July 14th, with mean temperature, 85.6° . The mercury reached or exceeded 90° on 35 days, viz.: 15 in July, 14 in August, and 6 in September.

The last light frost of spring was on May 14th; the first frost of autumn was on October 18th, giving an interval of 157 days entirely without frost. The last severe frost of spring was on March 4; the first severe frost of autumn was on October 18th, giving an interval of fully seven months, or 228 days, without severe frost. No frost or cold weather during the year caused any damage to fruit or fruit buds.

RAIN.

The entire amount of rain, including melted snow, was 38.39 inches, which is 3.48 inches above the average annual amount for the ten preceding years. Either rain or snow fell on 107 days. The longest interval without rain during the growing season, (March 1st to October 1st,) was 12 days, July 8th to 20th. The number of thunder showers was 38. These occurred in all months of the year except November and December. There were three light hail storms.

SNOW.

The entire depth of snow was $25\frac{1}{2}$ inches, of which $2\frac{1}{2}$ inches fell in February, 1 inch in October, 2 inches in November, and 20 inches in December. The last snow of spring was on March 29th; the first snow of autumn was on October 26th. The single storm of December 12th and 13th brought 14 inches of snow—this being the greatest snowfall on our eleven years' record.

FACE OF THE SKY.

The average cloudiness of the year was 40.65 per cent., which is 4.52 per cent. below the average. The number of clear days (less than one-third cloudy) was 190; half-clear days (from one-third to two-thirds cloudy), 93; cloudy (more than two-thirds), 82. There were 59 entirely clear, and 37 entirely cloudy days. The clearest month was August, with an average cloudiness of 19.19 per cent.; the cloudiest month was February, with an average of 54.63 per cent. The mean cloudiness at 7 a. m. was 47.32 per cent.; at 2 p. m., 44.99 per cent.; at 9 p. m., 29.66 per cent.

DIRECTION OF THE WIND.

During the year, three observations daily, the wind was from the N. W. 327 times; S. W., 281 times; S. E., 134 times; N. E., 136 times; E., 60 times; S., 55 times; N., 53 times; W., 28 times; calm, 21 times. The north

wind (including northwest, north and northeast) outnumbered the south winds (including southwest, south and southeast), in the ratio of 516 to 470.

VELOCITY OF THE WIND.

The number of miles traveled by the wind during the year was 125,793, which is 16,078 miles less than the average annual distance for the past six years. This gives a mean daily velocity of 344.47 miles, and an average hourly velocity of 14.34 miles. The highest hourly velocity was 60 miles, on April 9th; the highest daily velocity was 919 miles, on March 8th; the highest monthly velocity was 15,106, in October. The three windiest months were March, May and October; the three calmest months were February, July and August. The average hourly velocity of the wind at 7 a. m. was 13.44 miles; at 2 p. m., 16.39 miles; at 9 p. m., 14.07 miles.

BAROMETER.

Mean height of the barometer, 29.067 inches; mean at 7 a. m., 29.090 inches; at 2 p. m., 29.047 inches; 9 p. m., 29.063 inches. Maximum, 29.735 inches, on December 24th; minimum, 28.335, on April 9th; yearly range, 1.400 inches. The highest monthly mean was 29.268 inches, in December; the lowest was 28.851 inches, in April. The barometer observations are corrected for temperature and instrumental error.

RELATIVE HUMIDITY.

The average atmospheric humidity for the year was 70.4; at 7 p. m., 81.26; at 2 p. m., 50.82; at 9 p. m., 77.22. The dampest month was July, with mean humidity, 78.27; the driest month was November, with mean humidity, 62.60. There were only five fogs during the year. The lowest humidity for any single observation was 18.2, on November 23d.

The following table gives the mean temperature, the extremes of temperature, the velocity of the wind, the percentage of cloudiness, the relative humidity, and the rainfall, for each month of the year 1878.

MONTHS.	Mean temperature.	Maximum temperature.	Minimum temperature.	Miles of wind.	Mean cloudiness.	Relative humidity.	Rainfall, inches.
January	33.97	55.0	7.5	9,996	47.42	73.40	3.05
February	40.22	66.0	15.5	7,393	54.63	76.50	2.86
March	50.90	81.0	27.0	11,994	40.86	67.64	2.67
April	58.60	82.0	36.0	11,482	38.22	66.03	5.48
May	62.60	85.0	38.5	12,207	52.90	70.90	5.66
June	69.79	89.0	50.0	9,187	48.66	74.80	5.67
July	78.48	98.0	58.0	7,974	31.29	78.27	4.30
August	77.14	98.0	56.0	8,188	19.19	74.60	2.22
September	67.58	94.5	41.0	11,972	30.66	66.40	2.51
October	55.55	87.0	20.0	15,106	28.92	63.70	0.44
November	45.87	72.0	22.0	11,198	42.00	62.60	1.55
December	23.05	53.0	-6.0	9,096	55.75	65.70	1.98

SUMMARY FOR THE YEAR 1879.

The chief characteristics of the weather of 1879 were the high average temperature of the spring and autumn months, the long period of immunity from severe frost, the deficient rainfall of March, May and August, the extraordinary rainfall of November, and the low percentage of cloudiness. It is worthy of note that, notwithstanding the deficiency of rain in the months above named, the crops have been abundant in all the agricultural sections of the State.

TEMPERATURE.

Mean temperature of the year, 54.67° , which is 1.51° above the mean of the eleven preceding years. The highest temperature was 99.5° , on August 4th; the lowest was 16° below zero, on the 4th of January—giving a yearly range of 115.5° . Mean temperature at 7 a. m., 48.61° ; at 2 p. m., 63.71° ; at 9 p. m., 53.18° .

Mean temperature of the winter months, 27.93° , which is 1.94° below the average winter temperature; of the spring, 58.04° , which is 4.83° above the average; of the summer, 76.05° , which is $.47^{\circ}$ below the average; of the autumn, 56.71° , which is 3.90° above the average.

The coldest month of the year was January, with mean temperature, 23.49° ; the coldest week was January 2d to 8th, with mean temperature, 3.90° ; the coldest day was January 3d, with mean temperature, 9.3° below zero. The mercury fell below zero 13 times, of which 10 were in January and 3 in December.

The warmest month was July, with mean temperature 79.14° ; the warmest week was July 5th to 11th, with mean temperature 83.54° ; the warmest day was July 22d, with mean temperature, 86.9° . The mercury reached or exceeded 90° on 48 days, viz.: 4 in May, 12 in June, 16 in July, 14 in August, and 2 in September.

The last light frost of spring was on April 18th; the first light frost of autumn was on October 19th—giving an interval of 184 days entirely without frost. The last severe frost of spring was on April 4th; the first severe frost of autumn was on October 24th—giving an interval of nearly seven months, (203 days,) without severe frost. The severe cold weather of January and the frost of April 3d were very destructive to the buds of peaches, pears and early apples in many localities, but there was generally a fair crop of small fruit and winter apples.

RAIN.

The entire amount of rain, including melted snow, was 32.68 inches, which is 2.70 inches below the average annual amount for the eleven preceding years. Either rain or snow fell on 90 days, 12 less than the average. The longest interval without rain, during the growing season, (March 1st to October 1st,) was 19 days, from April 30th to May 19th. The number of thunder showers was 36, of which 9 were in June and 1 in December. There were 5 light hail storms.

SNOW.

The entire depth of snow was 10.35 inches, of which .85 inch fell in

January, 4.51 inches in February, 2 inches in November, and 3 inches in December. The last snow of spring was on February 23d; the first snow of autumn was on November 28th.

FACE OF THE SKY.

The average cloudiness of the year was 40.1 per cent., which is 4.75 per cent. below the average. The number of clear days (less than one-third cloudy), was 179; half-clear days (from one-third to two-thirds cloudy), 114; cloudy, (more than two-thirds), 72. There were 61 entirely clear and 35 entirely cloudy days. The clearest month was August, with an average cloudiness of 28.92 per cent.; the cloudiest month was December, with an average of 51.83 per cent. The mean cloudiness at 7 a. m. was 44.09 per cent; at 2 p. m., 46.27 per cent; at 9 p. m., 29.67 per cent.

DIRECTION OF WIND.

During the year, three observations daily, the wind was from the S. W. 272 times, N. W. 238 times, S. E. 158 times, S. 130 times, N. E. 112 times, E. 90 times, N. 71 times, W. 16 times, calm 8 times. The south winds, including southwest, south, and southeast, outnumbered the north winds, including northwest, north, and northeast, in the ratio of 560 to 421.

VELOCITY OF THE WIND.

The number of miles traveled by the wind during the year was 124,768, which is 14,160 miles less than the average for the past six years. This gives a mean daily velocity of 341.83 miles, and a mean hourly velocity of 14.24 miles. The highest hourly velocity was 60 miles, on February 25th and March 18th; the highest daily velocity was 960 miles, on March 8th; the highest monthly velocity was 13,787 miles, in March. The three windiest months were March, November, and December; the three calmest months were June, July, and August. The average hourly velocity at 7 a. m. was 12.78 miles; at 2 p. m., 16.29 miles; at 9 p. m., 14.03 miles.

BAROMETER.

Mean height of barometer column, 29.127 inches; at 7 a. m., 29.150 in.; at 2 p. m., 29.103 in.; at 9 p. m., 29.126 in.; maximum, 29.745 in., on January 3d; minimum, 28.534 in., on December 28th; yearly range, 1.211 in. The highest monthly mean was 29.253 in., in January; the lowest was 29.024 in., in May. The barometer observations are corrected for temperature and instrumental error.

RELATIVE HUMIDITY.

The average atmospheric humidity for the year was 67.13; at 7 a. m., 77.86; at 2 p. m., 50.11; at 9 p. m., 73.41. The dampest month was January—mean humidity 76; the driest month was March—mean humidity 56.1. There were 10 fogs during the year. The lowest humidity for any single observation was 12.3, at 2 p. m., on March 9th—less than one-eighth of saturation.

In presenting this report, the writer desires to acknowledge his in-

debtedness to Prof. H. S. S. Smith, for taking the observations during seven weeks' absence in the summer vacation.

The following table gives the mean temperature, the extremes of temperature, the velocity of the wind, the per cent. of cloudiness, the relative humidity, and the rainfall, for each month of the year 1879:

MONTHS.	Mean temperature.	Maximum temperature.	Minimum temperature.	Miles of wind.	Mean cloudiness.	Relative humidity.	Rainfall, inches.
January	23.49	53.0	-16.0	8,309	43.98	76.0	0.37
February	34.06	74.0	5.0	10,097	39.04	64.7	0.41
March	48.22	87.0	11.0	13,787	46.02	56.1	0.37
April	56.40	84.0	20.0	11,231	49.67	61.0	4.18
May	69.50	93.0	43.0	12,057	37.20	60.9	1.60
June	73.22	97.0	45.0	9,498	41.33	69.9	7.14
July	79.14	97.5	62.5	6,980	34.89	73.8	3.66
August	75.78	99.5	49.0	6,815	28.92	63.8	1.03
September	65.40	92.0	42.0	10,237	37.00	64.0	3.57
October	60.46	87.5	25.5	10,952	31.94	71.2	2.81
November	44.26	76.5	16.0	11,964	38.33	70.6	5.15
December	26.23	65.5	-9.0	12,821	51.83	74.0	2.39
Mean	54.67	83.8	24.5	10,397	40.01	67.1	2.72

SUMMARY FOR THE YEAR 1880.

The year 1880 surpassed all previous years of our record in the warmth of its January, the coldness of its November, its maximum monthly and hourly velocity of wind, and the earliness of its spring and winter. Maples were in blossom February 11th, and the genuine winter weather began November 11th, continuing without interruption to the end of the year.

The temperature, wind velocity and relative humidity were above, while the fall of rain and snow and the cloudiness were below, the annual averages.

The most remarkable meteorological event of the year was the wind storm of March 27th, which filled the air to a great height with an almost impalpable dust, and obscured the sun during the entire day after 10 a. m.

TEMPERATURE.

Mean temperature of the year, 54.01°, which is .72° above the mean of the twelve preceding years. The highest temperature was 101°, on August 18th; the lowest was 12° below zero, on the 29th of December, giving a yearly range of 113°. Mean at 7 a. m., 48.10°; at 2 p. m., 66.55°; at 9 p. m., 52.20°.

Mean temperature of the winter months, 34.88°, which is 5.17° above the average winter temperature; of the spring, 56.63°, which is .33° below the average; of the summer, 74.92°, which is 1.60° below the average; of the autumn, 49.56°, which is 3.58° below the average.

The coldest month of the year was December, with mean temperature, 25.84°; the coldest week was December 25th to 31st, with mean temperature, 9.41°; the coldest day was December 28th, with mean temperature 2.7°

below zero. The mercury fell below zero only twice during the year, on December 28th and 29th.

The warmest month was July, with mean temperature 75.75°; the warmest week was August 13th to 19th, with mean temperature 82.61°; the warmest day was August 18th, with mean temperature 86°. The mercury reached or exceeded 90° on 41 days, viz: 1 in April, 7 in May, 8 in June, 13 in July, and 12 in August.

The last light frost of spring was on April 30th; the first light frost of autumn was on September 13th, giving an interval of 136 days (nearly 5 months) entirely without frost. The last severe frost of spring was on March 20th; the first severe frost of autumn was on October 17th, giving an interval of 211 days (nearly 7 months) without severe frost. No frost or cold weather during the year did any damage to fruit buds or trees. Both large and small fruits were produced abundantly.

RAIN.

The entire amount of rain, including melted snow, was 32.65 inches, which is 2.34 below the average annual amount for the 12 preceding years. Either rain or snow fell on 89 days—12 less than the average. On 11 of these days the quantity was too small for measurement. The longest interval without rain during the growing season (March 1st to October 1st) was 18 days—from August 2d to 19th. The number of thunder showers was 29. There were 4 light hail storms, all of which occurred in March, April and May.

SNOW.

The entire depth of snow was 7 inches, which is about one-third of the average. Of this amount, 3 inches fell in March, 2½ inches in November, and 1½ inches in December. The last snow of spring was on March 15th; the first snow of autumn was on November 16th.

FACE OF THE SKY.

The average cloudiness of the year was 40.15 per cent., which is 4.18 per cent. below the average. The number of clear days (less than one-third cloudy) was 196; half-clear days (from one-third to two-thirds cloudy), 87; cloudy (more than two-thirds), 83. There were 65 days on which the cloudiness averaged .8 or more. There were 51 entirely clear, and 33 entirely cloudy days. The clearest month was February, with an average cloudiness of 24.94 per cent.; the cloudiest month was December, with an average of 54.08 per cent. The mean cloudiness at 7 a. m. was 44.79 per cent.; at 2 p. m., 44.20 per cent.; at 9 p. m., 31.48 per cent.

DIRECTION OF WIND.

During the year, three observations daily, the wind was from the S. W. 324 times; N. W., 242 times; S. E., 158 times; S., 113 times; N. E., 107 times; E., 61 times; N., 55 times; W., 37 times; calm, once. The south winds (including southwest, south and southeast) outnumbered the north winds (including northwest, north and northeast) in the ratio of 595 to 404.

VELOCITY OF THE WIND.

The number of miles traveled by the wind during the year was 146,039,

which is 9,154 miles above the annual average for the seven preceding years. This gives a mean daily velocity of 399.01 miles, and a mean hourly velocity of 16.62 miles. The highest velocity was at the rate of 80 miles an hour, from 3:30 to 3:45 a. m., on April 18th. The highest daily velocity was 1,121 miles, on March 27th and April 18th; the highest monthly velocity was 16,709 miles, in April. The three windiest months were March, April and May; the three calmest months were July, August and September. The average hourly velocity at 7 a. m. was 15.30 miles; at 2 p. m., 18.44 miles; at 9 p. m., 15.70 miles.

BAROMETER.

Mean height of barometer column, 29.123 inches; at 7 a. m., 29.148 inches; at 2 p. m., 29.099 inches; at 9 p. m., 29.123 inches; maximum, 29,791 inches, on November 21st; minimum, 28.303 inches, on April 18th; yearly range, 1.488 inches. The highest monthly mean was 29.295 inches, in November; the lowest was 29.019 inches, in May. The barometer observations are corrected for temperature and instrumental error.

RELATIVE HUMIDITY.

The average atmospheric humidity for the year was 67.9; at 7 a. m., 79.2; at 2 p. m., 49.9; at 9 p. m., 74.6. The dampest month was December—mean humidity, 76.5; the driest month was April—mean humidity, 53.4. There were 18 fogs, of which 9 were in January, and 4 in December. The lowest humidity for any single observation was 11.8, at 2 p. m. on April 14th—less than one-eighth of saturation.

The following tables give the mean temperature, the extremes of temperature, the velocity of the wind, the per cent. of cloudiness, the relative humidity, the rainfall (including melted snow), and the depth of snow, for each month of the year 1880, and a comparison with the twelve preceding years:

1880.	Mean temperature.	Maximum temperature.	Minimum temperature.	Miles of wind.	Mean cloudiness.	Relative humidity.	Rainfall, inches.	Snow, inches.
January	41.23	67.0	20.5	12,861	48.49	73.8	1.80	0.0
February	37.58	69.0	8.0	11,881	24.94	64.5	0.73	0.0
March	42.38	79.0	2.5	13,841	44.94	53.4	2.03	0.0
April	56.92	93.0	31.0	16,709	34.56	53.4	1.75	0.0
May	70.59	94.0	52.0	14,108	40.43	62.6	4.11	0.0
June	73.57	96.0	50.5	12,629	37.00	68.1	4.10	0.0
July	75.75	98.0	54.0	9,312	28.23	68.3	2.34	0.0
August	75.45	101.0	50.5	8,863	45.70	70.8	7.93	0.0
September	64.59	85.0	42.0	10,124	32.00	73.2	2.46	0.0
October	52.52	81.0	28.0	12,745	39.24	66.3	2.73	0.0
November	31.58	65.5	7.5	11,325	51.77	74.4	2.24	2.5
December	25.84	61.0	-12.0	11,661	54.08	76.5	0.43	1.5
Mean	54.01	82.5	27.9	12,169	40.15	67.9	2.72	0.6

Comparison with previous years:

YEARS.	Mean temperature.	Maximum temperature.	Minimum temperature.	Miles of wind.	Mean cloudiness.	Relative humidity.	Rainfall, inches.	Snow, inches.	Rainy days.
1868	53.36	101.0	*—16.5	—	42.35	—	37.42	27.50	77
1869	50.99	96.0	—5.0	—	49.23	—	38.51	18.00	105
1870	54.50	102.0	—10.0	—	47.88	68.4	31.38	9.50	100
1871	54.30	103.0	—6.0	—	47.37	—	32.23	29.75	120
1872	51.90	97.0	—18.0	—	44.33	64.4	32.63	23.25	116
1873	52.71	104.0	—26.0	154,508	42.46	64.0	32.94	26.50	101
1874	54.20	108.0	—3.0	145,865	45.54	65.5	28.87	43.00	99
1875	50.60	99.0	—16.5	145,316	44.81	65.5	28.87	5.00	106
1876	52.76	98.0	—5.0	148,120	41.27	66.8	44.18	24.75	102
1877	54.16	99.0	—9.0	113,967	47.12	72.6	41.09	15.50	126
1878	55.33	98.0	—6.0	125,793	40.65	70.4	38.39	25.50	107
1879	54.67	99.5	—16.0	124,768	40.01	67.1	32.68	10.35	90
1880	54.01	101.0	—12.0	146,039	40.15	67.9	32.65	7.00	89
Mean, 13 years	53.34	100.4	—13.0	138,047	44.09	67.2	34.83	20.43	103

*The minus sign denotes temperature below zero.

PRELIMINARY LIST OF THE HYMENOPTERA OF KANSAS.

By Prof. F. H. Snow, University of Kansas.

The following species of Hymenoptera have been incidentally collected by the writer and his students, during the summer vacations of the past ten years, while chiefly engaged in making collections of Lepidoptera and Coleoptera. The list might have been considerably enlarged by including species known to have been taken in Kansas by Eastern collectors. But it has been thought best to include only those species which are contained in the University cabinets, the locality of whose capture is exactly known. The extreme eastern and western portions of the State have contributed the material here designated. The species from Douglas county were taken in the immediate vicinity of the city of Lawrence, at an elevation of nearly 1,000 feet above the level of the sea. The species from Wallace county were taken at various camping places on the so-called "Plains," at an elevation of about 3,500 feet.

I am greatly indebted to Mr. E. T. Cresson, of Philadelphia, for valuable aid in the determination of the species.

It is hoped that this neglected order of insects may in the future receive a larger share of attention from Kansas entomologists, not only with a view to enlarging the list of species, but especially for the purpose of increasing our knowledge of their habits.